

## PBDEs Levels in Commercial Fishery and Aquaculture Products from Spain

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### Introduction.

Polybromo diphenyl ethers (PBDEs) constitute a family of brominated compounds which are used as flame retardants in plastics and foams of electronic equipments. They are lipophilic and hydrophobic compounds that show persistent properties. Their high resistance to basic, acid and oxidation-reduction reactions become them in dangerous pollutants when they are spread to the environment, where they could be long time (de Boer, 2000; Covaci 2003). Thereby, PBDEs are bioaccumulated in the food chain, especially at the top of the pyramid where higher levels could cause unhealthy effects (Wolkers, 2004; Ueno, 2004).

### Materials and Methods.

5 g of sample were dried with anhydrous sodium sulfate during 24 hours. Then fat was extracted in a chromatographic column (26 cm x 1.2 cm ID) eluted with 100 mL of pentane:dichloromethane (1:1). Solvent is evaporated to 3 mL. Sample is purified by solid phase extraction technique using acid silica cartridge. Extract (60 mL) is evaporated to dryness and internal standard solution is added. 2  $\mu$ L aliquot are injected on a high resolution gas chromatography (Varian CP-3800) and ion trap mass spectrometer (Varian 4000).

### Results and Discussion.

PBDEs pollution has been evaluated from 12 compounds in 49 commercial samples in Spain. Samples were classified in 11 groups depending on the species and the commercial product.

Table 1. 12 PBDEs concentration in 11 Spanish food groups

Matrix	N	Media (ng/g)	Standard Deviation	Maximum Value (ng/g)	Minimum Value (ng/g)
Raw Tuna	5	0.03	0.03	0.07	< LOD
Raw Light Tuna	5	0.06	0.14	0.31	< LOD
Rawh White Tuna	5	0.41	0.32	0.94	0.11
Salmon	6	2.51	1.05	3.48	1.21
Sardine	5	0.90	0.48	1.53	0.37
Mussel	5	< LOD	0.00	< LOD	< LOD
Hake	5	< LOD	0.00	< LOD	< LOD
Trout	5	1.17	0.98	2.19	0.13
Mackerel in Oil	3	0.88	0.45	1.37	0.50
White Tuna in Oil	1	0.33	---	0.33	0.33
Light Tuna in Oil	4	0.09	0.16	0.33	< LOD

Results showed in table 1 allow to monitoring PBDEs pollution in fishery and aquaculture products from Spanish market (Figure 1).

Due to lipophilic and hydrophobic characteristics of these compounds, PBDEs levels are higher in fatty samples, salmon is the most polluted product. However PBDEs levels have not been detected in hake and mussel samples.

Aquaculture species show higher contamination levels than wild fishes, salmon and trout show the highest PBDEs values.

Another important feature is that pollution varies significantly depending on the area. Higher levels have been found in fishing contaminated zones (White tuna is caught in Cantabric Sea and present higher levels than tuna and light tuna which are captured in Atlantic or Pacific Ocean). Also zones near seashore display higher PBDEs levels (sardine is one of the most polluted samples).

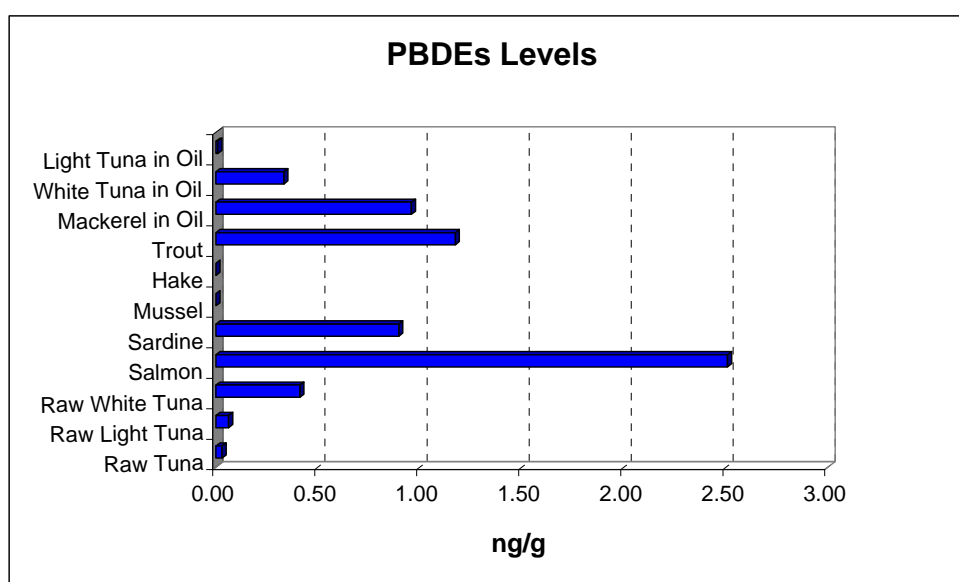


Figure 1. PBDEs concentration in fishery and aquaculture products.

Isomers concentration results show that PBDE-47 is the majority (Wolkers, 2004), upper than 4 times, follows by PBDE-100 and PBDE-99. In other hand, PBDE-85 and PBDE-183 have not been detected in any sample. These data are in concordance with bibliography results (Figure 2).

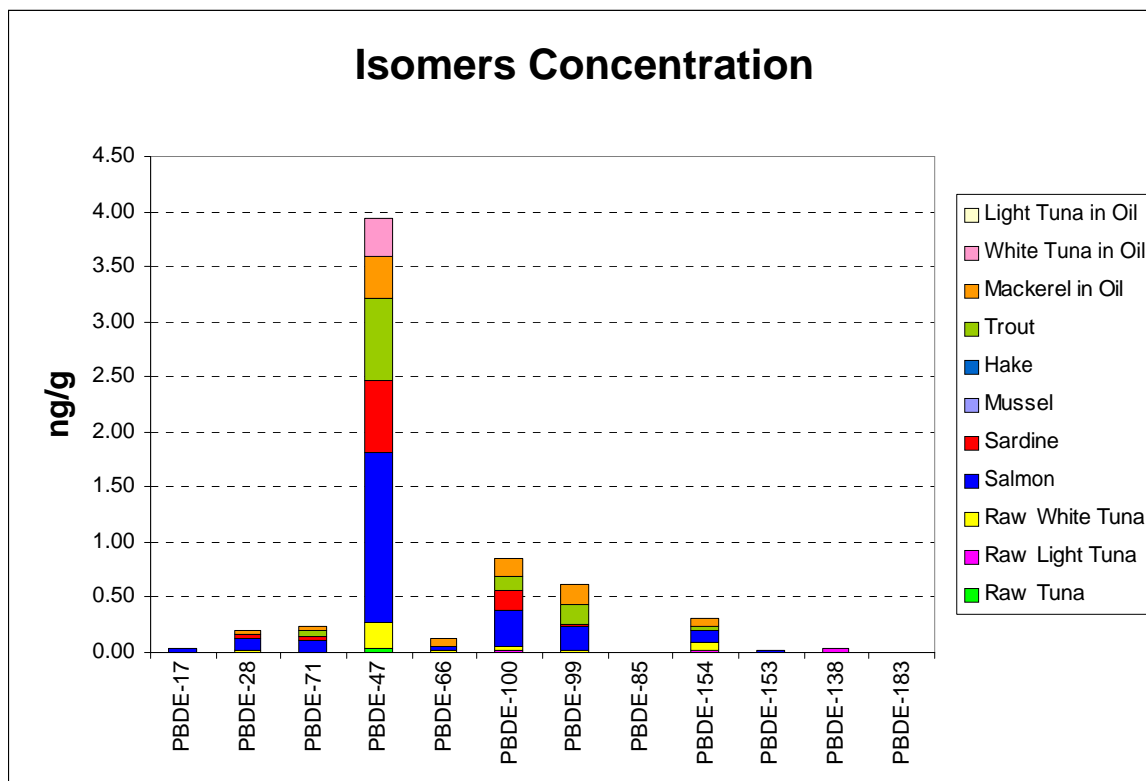


Figure 2. Isomer concentrations depending on the product.

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